

Social Network Analysis

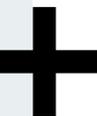
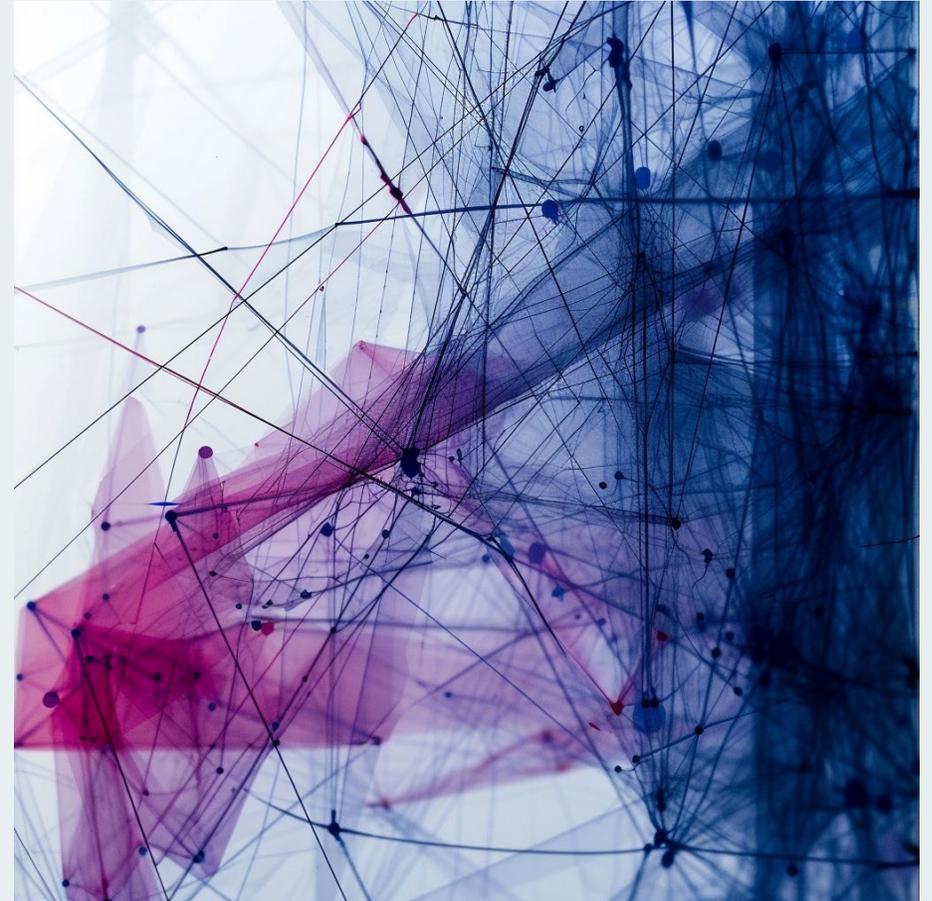
Course Intro.

Dr. Chun-Hsiang Chan

Department of Geography,
National Taiwan Normal University

Outline

- Lecturer introduction
- What is the social network?
- Why do you need to take this course?
- What will you learn from this course?
- Syllabus
- Grading policy



Lecturer intro.

Present Position

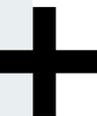
- Assistant Professor | Department of Geography, National Taiwan Normal University

Education

- Ph.D. | Department of Geography, National Taiwan University
- M.S. | Department of Geography, National Taiwan University
- M.S. | Department of Food Science, Nutrition, and Nutraceutical Biotechnology, Shih Chien University
- B.S.S. | Department of Social and Regional Development, National Taipei University of Education

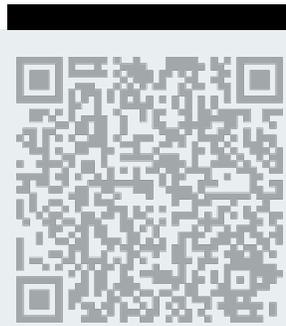
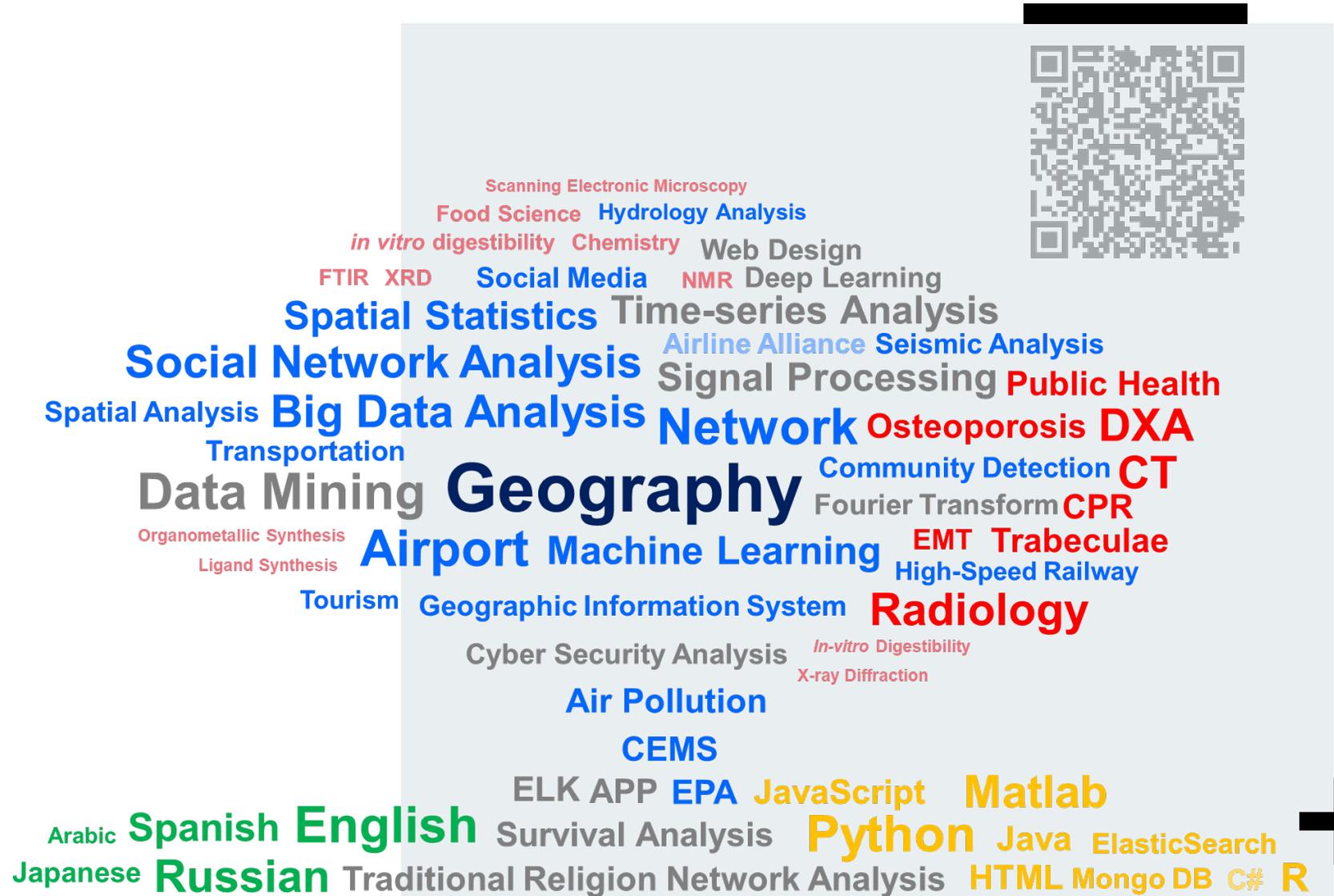
Working Experience

- Assistant Professor | Undergraduate/ Master Program in Intelligent Computing and Big Data, Chung Yuan Christian University
- AI Consultant | Taiwan Cybersecurity Foundry Company
- Adjunct Data Scientist | Institute of Sociology, Academia Sinica
- Adjunct Assistant Professor | Department of Artificial Intelligence, Tamkang University
- Postdoctoral Research Fellow | Department of Radiology, School of Medicine, Taipei Medical University
- Postdoctoral Research Fellow | Department of Radiology, Taipei Municipal Wan Fang Hospital, Taipei Medical University
- Data Scientist Engineer | Cybersecurity Technology Institute, Institute for Information Industry
- Intern Research Assistant | National Science and Technology Center for Disaster Reduction



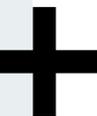
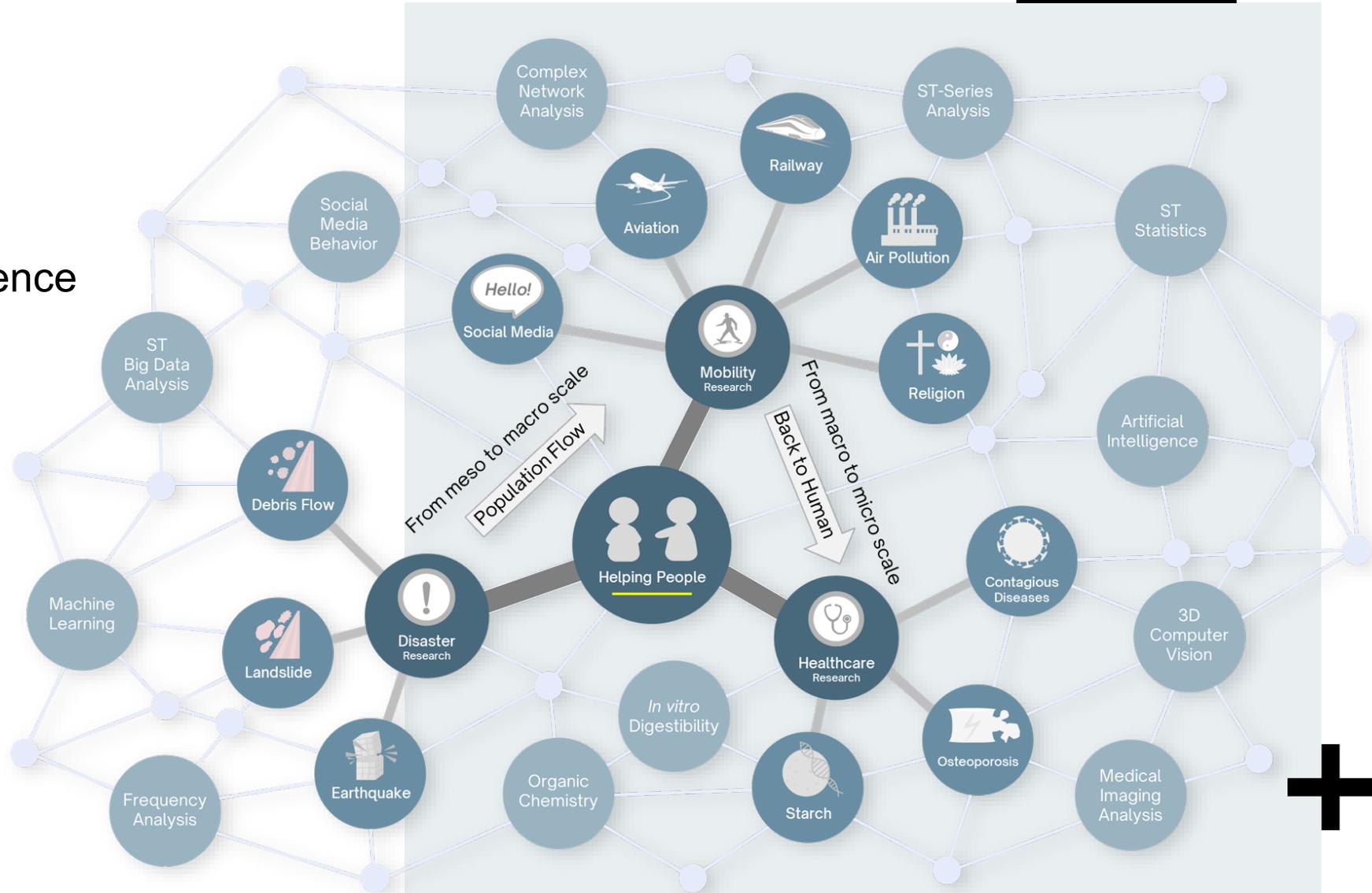
Skill tree

- Geography (GIS)
- Computer Science
- Radiology (bone & EM)
- Public Health
- Traditional Medicine
- Chemistry (basic & food)
- Cybersecurity
- Language (Russian)
- ...

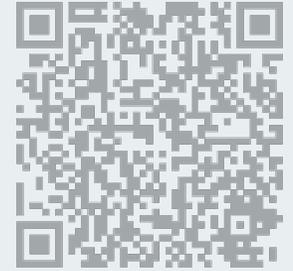


Research interests

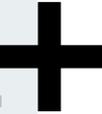
- Spatiotemporal Data Science
- Artificial Intelligence (GeoAI & Explainable AI)
- Machine Learning
- Disaster Prevention
- Clinical Medicine (Ortho & EMS)
- Food Chemistry
- Cybersecurity



Research community

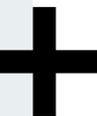


– My collaborators come from 29 academic institutions and companies across 6 countries.



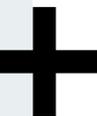
What is the social networks?

- **Complex networks are related to social networks.**
- A social network is a set of relations **[edge]** between subjects **[node]** (e.g., countries or people), and the relations could be anything (actual existence or abstract concept), such as trading volume and social media friendship.



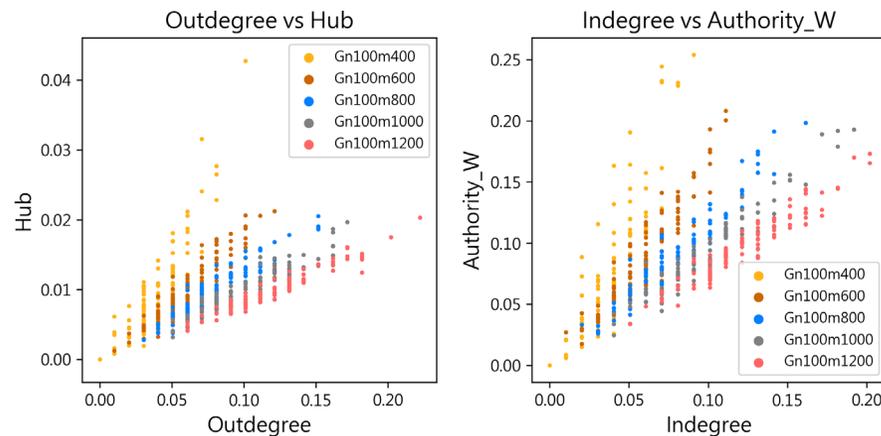
What is the social networks?

- We may leverage various **quantitative** parameters to **characterize** the network structure (node and edge).
- Social network analysis has been adopted in various non-sociological research, and the network structure has become much larger and more complicated; therefore, we call these types of complex networks.

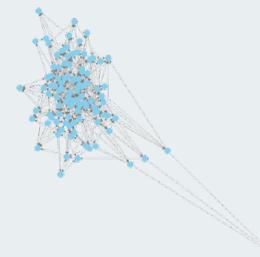


Why do you need to take this course?

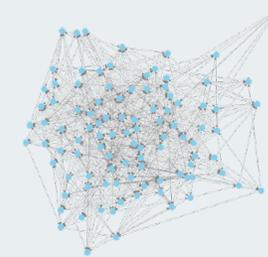
- This course will teach the fundamental concepts of network formation and quantitative characterization for network structure, network visualization, community detection, and network autoregression. (*Graph Deep Learning*)



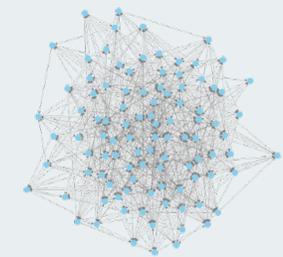
Gnm_random_graph n=100 m=400



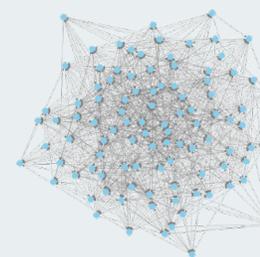
Gnm_random_graph n=100 m=600



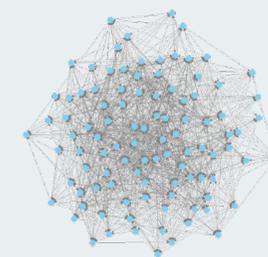
Gnm_random_graph n=100 m=800



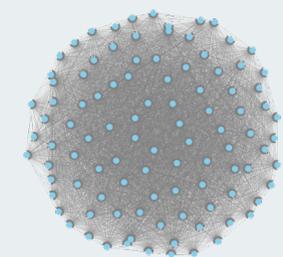
Gnm_random_graph n=100 m=1000



Gnm_random_graph n=100 m=1200



Complete graph n=100

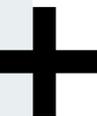


Syllabus

Week	Date	Content
1	Feb. 23	Course Introduction
2	Mar. 2	Introduction to Complex Network
3	Mar. 9	Data Collection and Network Formation *
4	Mar. 16	Ego Network *
5	Mar. 23	Centrality I *
6	Mar. 30	Centrality II
7	Apr. 6	Network Visualization
8	Apr. 13	Midterm Pitch
9	Apr. 20	Group

* Indicates online course

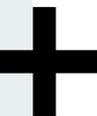
Week	Date	Content
10	Apr. 27	Network Positions
11	May 4	Two-mode Networks
12	May 11	Network Autoregression
13	May 18	Quadratic Assignment Procedure
14	May 25	Graph ML Intro.
15	Jun. 1	Final Project Presentation
16	Jun. 8	(Final Exams)



Grading policy

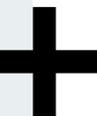
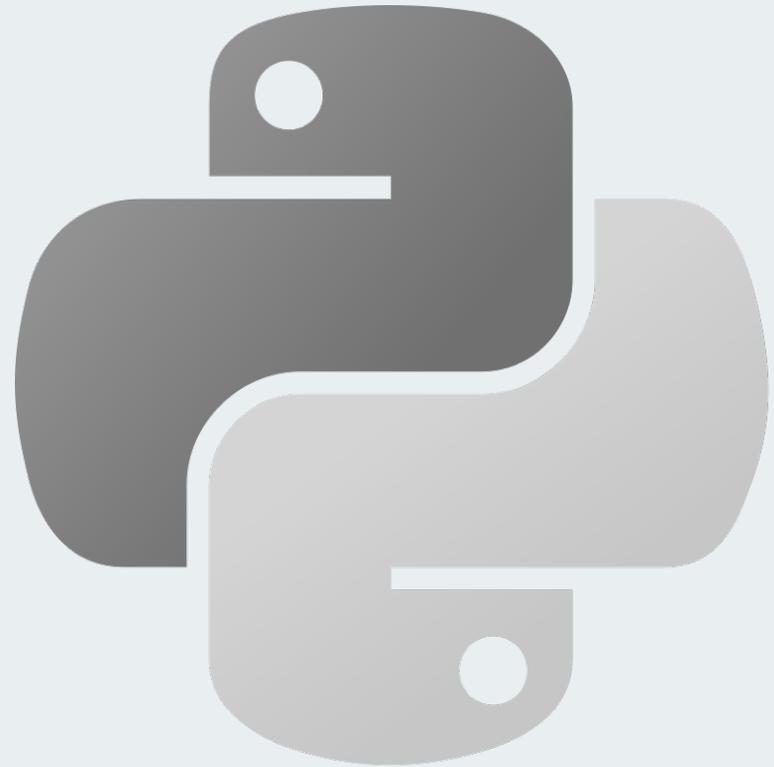
- All you have to do is study hard and feel free to ask questions when you do not understand.
- I believe that if you fulfill all the required items, you will pass this course.
- Do not worry about the grade! The most important thing is what you learn from this course.

Assignments	30 %	Midterm Report	20 %
Attendances	10 %	Final Report	40 %



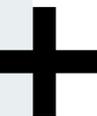
Requirements

- In this course, we will **NOT** teach you how to design a program with Python.
- So, if you are **NOT** familiar with Python, please put **MORE EFFORT** into learning Python programming by any tutorials.
- Basically, ... ***DON'T WORRY*** ...



Textbooks

- Erwin Kreyszig (2018) Advance Engineering Mathematics 10e. Wiley. ISBN: 978-1-119-93416-5.
- Dmitry Zinoviev (2018) Complex Network Analysis in Python. Pragmatic Bookshelf. ISBN: 9781680502695.
- Krishna Raj P. M., Ankith Mohan, K. G. Srinivasa (2018) Practical Social Network Analysis in Python. Springer.



Assignments

- Small Mathematical Problems
- Coding Practice
- Paper Reading

$$C_i = \frac{\lambda_G(v)}{\tau_G(v)},$$

$$\tau_G(v) = C(k_i, 2) = \frac{1}{2}k_i(k_i - 1)$$

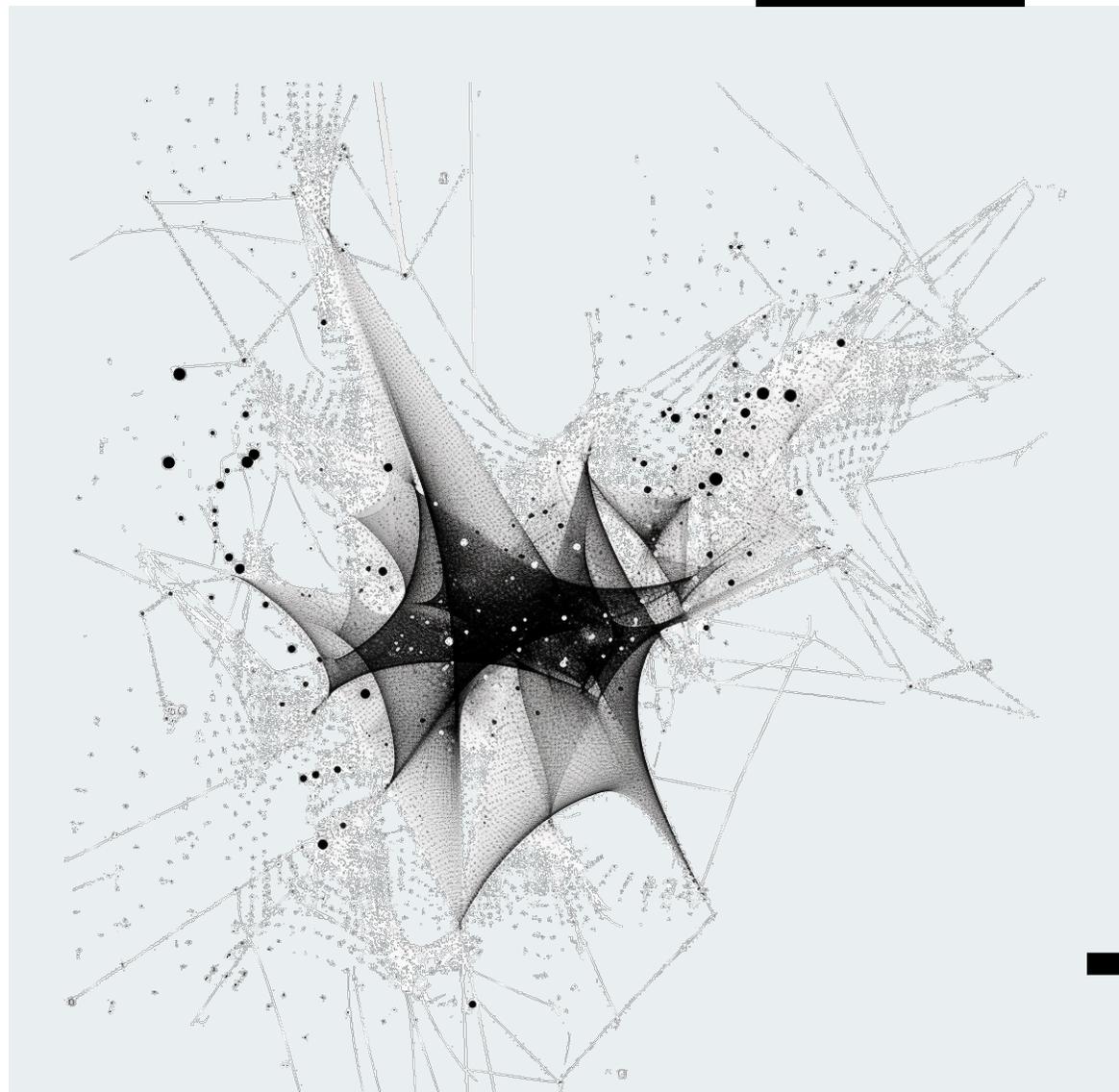


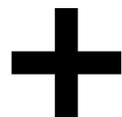
Photo credit: midjourney



Social Network Analysis

The End

Thank you for your attention!



Email: chchan@ntnu.edu.tw
Website: toodou.github.io